UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/955,111	09/19/2001	Satoshi Maemori	2001-1300A	9635

513 7590 09/07/2005

WENDEROTH, LIND & PONACK, L.L.P.
2033 K STREET N. W.
SUITE 800
WASHINGTON, DC 20006-1021

EXAMINER	
LEE, SIN J	

ART UNIT	PAPER NUMBER
1752	

DATE MAILED: 09/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/955,111	MAEMORI ET AL.	
	Examiner	Art Unit	
	Sin J. Lee	1752	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 June 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *18* is/are allowed.

6)☒ Claim(s) *1-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. In view of applicants' argument, previous 112, first paragraph rejection on claims 1-17 is hereby withdrawn.

2. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Claim Rejections - 35 USC § 103

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. Claims 1, 2, 4, 5, 10, 12, 15, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujie et al (6,303,264 B1).

Fujie et al teach (col.2, lines 13-21 and Example 1) a chemical amplified type positive working resist composition suitable *for use with KrF excimer laser* comprising a polymer capable of becoming alkali-soluble owing to the action of an acid such as *poly[p-(1-ethoxyethoxy)styrene/p-hydroxystyrene]* (in this polymer, the *1-ethoxyethyl*

group (an alkoxyalkyl group) as in the 1-ethoxyethoxy moiety is an *acid-dissociable group*), a photoacid generator, and a solvent. Fujie furthermore teaches (col.20, lines 20-23, lines 59-61, col.21, lines 1-4) that surfactants such as fluorine-containing nonionic surfactants can be added in the amount of *0.001* to 10 parts by weight per 100 parts by weight of his polymer components. Since 0.001 parts by weight is included as the lower end of the taught range, one of ordinary skill in the art would immediately envisage using 0.001 parts by weight of the surfactant in Fujie's resist composition. The value of 0.001 parts by weight per 100 parts by weight of the polymer component converts to *10 ppm by weight* (0.001 / 100 = 10^{-5} = 10 ppm).

In present claim 1, applicants state that the amount of the surface active agent is lower than 10 ppm, and the term "lower than 10 ppm" includes 9.9 ppm, for example. The value of 10 ppm, which is taught by Fujie, is so close to 9.9 ppm that one skilled in the art would have expected them to have the same properties, and thus, Fujie's teaching would render present range *prima facie* obvious. Where the claimed ranges and prior art do not overlap but are close enough that one skilled in the art would have expected them to have the same properties, a *prima facie* case of obviousness would exist which may be overcome by a showing of unexpected results, In re Titanium Metals Corporation of America v. Banner, 227 USPQ 773 (Fed. Cir. 1985). Therefore, Fujie's teaching would render obvious present inventions of claims 1, 2, 4, 5, and 10 (since the prior art teaches all of the present components of claim 1, the prior art's composition would *inherently* be suitable for the formation of a photoresist layer having a thickness in the range from 100 to 570 nm on the surface of a substrate as presently recited in

claim 1. *Besides, Fujie teaches in col.21, lines 33-37 that his resist composition can form a resist film of 0.5-2 um thickness, and 0.5 um converts to 500 nm, which lies within the present range of 100-570 nm*).

With respect to present claim 12, Fujie states (col.33, lines 12-17) that his composition is also usable for pattern formation using ArF excimer laser beams. Therefore, it is implied that Fujie's photoacid generator is capable of generating an acid by the irradiation with ArF excimer laser beams. Therefore, Fujie's teaching would render obvious present invention of claim 12.

With respect to present claim 13, Fujie teaches (col.20, lines 24-51) that sensitivity adjustors such as trialkylamines (in Example 1, Fujie specifically uses tri-n-propylamine compound which is a tertiary aliphatic amine compound) can be added in the amount of 0.001 to 10 parts by weight per 100 parts by weight of their polymer components. Since this range overlaps with present range of 0.01 to 1 part by weight, the prior art's range would have made present range *prima facie* obvious. See In re Wertheim, supra. Therefore, Fujie's teaching would render obvious present invention of claim 13.

With respect to present claims 15 and 17, Fujie teaches (col.21, lines 33-37) that his resist composition is spin-coated onto a semiconductor substrate and baked on a hot plate to obtain a resist film of 0.5 - 2 um thickness, which converts to 500 nm to 2,000 nm thickness. Since this range overlaps with present ranges of claims 15 and 17, the prior art's range would have made present ranges *prima facie* obvious. In the case "where the [claimed] ranges overlap or lie inside ranges disclosed by the prior art," a

prima facie case of obviousness would exist which may be overcome by a showing of unexpected results, In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976). Therefore, Fujie's teaching would render obvious present inventions of claims 15 and 17.

5. Claims 6-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujie et al (6,303,264 B1) in view of Urano et al (JP 05-194472 and its machine-assisted English translation provided by Japan Patent Office).

Fujie et al with respect to present claim 2 is discussed above in Paragraph 4. In Example 1, Fujie's composition contains poly[p-(1-ethoxyethoxy)styrene/p-hydroxystyrene]. In Example 2, his composition contains poly(p-tert-butoxystyrene/p-hydroxystyrene), and in Example 3, his composition contains poly-(p-1-tetrahydropyranyloxystyrene/p-hydroxystyrene). However, the prior art does not specify what molar% of the acid dissociable groups (such as 1-ethoxyethyl group, tert-butyl group and tetrahydropyranyl group) is substituting for the hydrogen atoms in the hydroxyl groups of hydroxystyrene. Fuji states in col.14, lines 8-12 that his polymer capable of becoming alkali-soluble can be obtained by the processes disclosed in JP 05-194472 (Urano et al). In the machine-assisted translation of the Japanese document (see [0022] and [0023]), it is indicated that poly(p-tert-butoxystyrene/p-hydroxystyrene) and poly-(p-1-tetrahydropyranyloxystyrene/p-hydroxystyrene) are synthesized, and in both of the instances, the acid-dissociable group (tert-butyl group and tetrahydropyranyl group) are being present in the amount of 10 molar %. It would have been obvious to one of ordinary skill in the art to make Fujie' polymer which are capable of becoming

alkali-soluble (such as the ones shown in his Examples) such that the acid-dissociable group in each polymer would be present in the amount of 10 molar % because Fujie refers to JP 05-194472 for the synthesis of his polymers and because the Japanese document clearly teaches that the acid-dissociable groups are substituting for the hydrogen atoms in the hydroxyl groups of hydroxystyrene in the amount of 10 molar %. Therefore, Fujie in view of Urano would render obvious present invention of claim 6.

With respect to present claim 7, in Example 20 (see Table 8), Fujie uses combination of 4.5 g of poly[p-(1-ethoxyethoxy)styrene/p-hydroxystyrene] (Mw: 20,000 and dispersity: 1.85) and 1.5 g of poly[p-tert-butyloxycarbonyloxystyrene/p-hydroxystyrene] (Mw: 8,000 and dispersity: 1.85). As discussed above with respect to present claim 6, it would have been obvious to one of ordinary skill in the art to make Fujie's polymers in Example 20 such that the acid-dissociable groups in each polymer would be present in the amount of 10 molar % because Fujie refers to JP 05-194472 for the synthesis of his polymers and because the Japanese document clearly teaches that the acid-dissociable groups are substituting for the hydrogen atoms in the hydroxyl groups of hydroxystyrene in the amount of 10 molar %. Therefore, Fujie in view of Urano would render obvious present invention of claim 7 (present ratio of (b1):(b2) for Fujie's polymers in his Example 20 would be 0.333 which lies between the present range of 10:30 (0.111) to 90:10 (9)).

With respect to present claim 9, in Example 19 (see Table 8), Fujie uses combination of 4.5 g of poly[p-(1-ethoxyethoxy)styrene/p-hydroxystyrene] (Mw: 20,000 and dispersity: 1.80) and 1.5 g of poly[p-tert-butoxystyrene/p-hydroxystyrene] (Mw:

8,000 and dispersity: 1.95). As discussed above with respect to present claim 6, it would have been obvious to one of ordinary skill in the art to make Fujie's polymers in Example 19 such that the acid-dissociable groups in each polymer would be present in the amount of 10 molar % because Fuji refers to JP 05-194472 for the synthesis of this polymer and because the Japanese document clearly teaches that the acid-dissociable groups are substituting for the hydrogen atoms in the hydroxyl groups of hydroxystyrene in the amount of 10 molar %. Therefore, Fujie in view of Urano would render obvious present invention of claim 9 (present ratio of (b1):(b2) for Fujie's polymers in his Example 19 would be 0.333 which lies between present range of 19:90 (0.111) to 90:10 (9)).

With respect to present claim 8, as explained above, in his Example 19, Fujie uses combination of 4.5 g of poly[p-(1-ethoxyethoxy)styrene/p-hydroxystyrene] (Mw: 20,000 and dispersity: 1.80) and 1.5 g of poly[p-tert-butoxystyrene/p-hydroxystyrene] (Mw: 8,000 and dispersity: 1.95). Fujie also teaches the equivalence of poly[p-tert-butoxystyrene/p-hydroxystyrene] and poly[p-tetrahydropyranyloxystyrene/p-hydroxystyrene] in col.11, lines 24-44. Because the prior art teaches the equivalence of these two polymers, it would have been obvious to one of ordinary skill in the art to replace the poly[p-tert-butoxystyrene/p-hydroxystyrene] in Fujie's Example 19 with the poly[p-tetrahydropyranyloxystyrene/p-hydroxystyrene] and use the combination of 4.5 g of poly[p-ethoxyethoxy)styrene/p-hydroxystyrene] (Mw: 20,000 and dispersity: 1.80) and 1.5 g of poly[p-tetrahydropyranyloxystyrene/p-hydroxystyrene] (Mw: 8,000 and dispersity: 1.95) in the Example 19. As discussed above with respect to present claim

6, it would have been obvious to one of ordinary skill in the art to make Fujie's polymers in Example 19 such that the acid-dissociable groups in each polymer would be present in the amount of 10 molar % because Fuji refers to JP 05-194472 for the synthesis of this polymer and because the Japanese document clearly teaches that the acid-dissociable groups are substituting for the hydrogen atoms in the hydroxyl groups of hydroxystyrene in the amount of 10 molar %. Therefore, Fujie in view of Urano would render obvious present invention of claim 8 (present ratio of (b1):(b2) for Fujie's polymers in his Example 19 would be 0.333 which lies between present range of 19:90 (0.111) to 90:10 (9)).

6. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujie et al (6,303,264 B1) in view of Padmanaban et al (6,329,117 B1).

Fujie et al with respect to present claim 15 is discussed above in Paragraph 4. Fujie does not teach present antireflection coating film of claim 16. Padmanaban (see col.3, lines 52-56 and col.11, lines 55-67) teaches providing an anti-reflective coating film between a substrate and a positive working chemically amplified deep UV photoresist composition layer in order to reduce problems associated with reflected light from the substrate and topography during pattern formation. Padmanaban teaches forming such anti-reflective coating film having thickness of 60 nm on a silicon wafer. Based on Padmanaban's teaching, it would have been obvious to one of ordinary skill in the art to provide an anti-reflective coating film having thickness of 60 nm between Fujie's semiconductor substrate and his photoresist composition layer with a reasonable expectation of reducing problems associated with reflected light from the substrate and

topography during pattern formation as taught by Padmanaban et al. Therefore, Fujie in view of Padmanaban would render obvious present invention of claim 16.

7. Claims 1, 3-5, 10, 12, 13, 15, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al (6,365,321 B1) in view of Fujie et al (6,303,264 B1).

Chen et al teach a photoresist binder composition comprising a homogeneous blend of (i) a hydroxystyrene copolymer comprising a first monomer that is substituted or unsubstituted hydroxystyrene and a second monomer containing a photoacid-cleavable alicyclic ester group, and (ii) a phenolic polymer, wherein the phenolic polymer is selected from the group consisting of polyhydroxystyrene, poly(hydroxystyrene-co-styrene), *poly(hydroxystyrene-co-styrene-co-t-butyl acrylate)*, novolac, and combinations thereof. See claims 1 and 10. Since there are only four examples given for the phenolic polymer component, it is the Examiner's position that one of ordinary skill in the art would immediately envisage poly(hydroxystyrene-co-styrene-co-t-butyl acrylate to be the phenolic polymer component in Chen's invention. Since Chen's poly(hydroxystyrene-co-styrene-co-t-butyl acrylate) contains the *t-butyl acrylate* repeating unit, the prior art's phenolic polymer contains an acid-dissociable group (*tert-butyl group*) and is capable of being imparted with increased solubility in an aqueous alkaline solution by interaction with an acid.

Chen's lithographic resist composition additionally comprises a radiation-sensitive acid generator which generates an acid upon exposure to radiation such as *KrF excimer*. See col.2, lines 30-33, col.10, and lines 44-48.

Although Chen teaches (col.9, lines 51-53) that surfactants may be used in his composition to improve coating uniformity, the prior art does not explicitly teach the amount of the surfactants to be used. Fujie et al, a reference which also teaches a chemically amplified positive resist composition, teaches (col.20, lines 61-67, col.21, lines 1-4) that surfactants preferably used to aid formation of a resist film are fluorine-containing nonionic surfactants and that the amount of the surfactants is preferably 0.001 to 10 parts by weight per 100 parts by weight of the polymer components. Since 0.001 part is included as the lower end of the taught range, it would have been obvious to one of ordinary skill in the art to use the fluorine-containing nonionic surfactant in Chen's invention in the amount of 0.001 parts by weight per 100 parts by weight of Chen's polymeric binder (this amount converts to *10 ppm by weight* ($0.001 / 100 = 10^{-5}$ = 10 ppm) of the surfactant based on the amount of Chen's polymeric binder) with a reasonable expectation of aiding formation of Chen's resist film as taught by Fujie.

In present claim 1, applicants state that the amount of the surface active agent is lower than 10 ppm, and the term "lower than 10 ppm" includes 9.9 ppm, for example. The value of 10 ppm, which is taught by Fujie, is so close to 9.9 ppm that one skilled in the art would have expected them to have the same properties, and thus, Fujie's teaching would render present range *prima facie* obvious. See In re Titanium Metals Corporation of America v. Banner, supra. Therefore, Chen in view of Fujie would render obvious present inventions of claims 1, 3-5, and 10 (since Chen in view of Fujie teach all of the claimed components for the present chemical-amplification positive-working photoresist composition of claim 1, it is the Examiner's position that the composition

taught by Chen in view of Fujie would inherently be suitable for the formation of a photoresist layer having a thickness in the range of 100-570 nm on the surface of a substrate as presently recited in claim 1; *besides*, Chen states in col.10, lines 42-44 that his dried resist film has a thickness of 0.1-5.0 microns (which is equal to *100*-5000 nm)).

With respect to present claim 12, Chen states (col.10, lines 44-47) that his resist film can be imagewise exposed to ultraviolet radiation at a wavelength of about 190-350 nm. Since an ArF excimer laser has wavelength of 193 nm, it is implied taught from Chen that Chen's photoacid generator is capable of generating an acid by the irradiation with ArF excimer laser beams. Therefore, Chen's teaching would render obvious present invention of claim 12.

With respect to present claim 13, although Chen teaches (col.9, lines 35-38) the use of nitrogenous compounds (such as tertiary amines) as stabilizers and acid-diffusion controlling additive (thus, Chen is using the nitrogenous compounds for the purpose that is the same as that of present invention – see pg.9, [0029] of present specification), the prior art does not explicitly teach the amount of such compounds to be used. However, the present range of claim 13 would have been obvious to one of ordinary skill in the art at the time the invention was made because it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). Therefore, Chen in view of Fujie would render obvious present invention of claim 13.

With respect to present claims 15 and 17, Chen teaches (col.10, lines 21-44) coating a substrate with a film comprising their lithographic resist composition, and the

prior art furthermore teaches the thickness of the dried film made of their lithographic resist composition to be 0.1-5.0 microns, which converts to 100-5000 nm. Since this range overlaps with present ranges of claims 15 and 17, the prior art's range would have made present ranges *prima facie* obvious. See In re Wertheim, supra. Therefore, Chen in view of Fujie would render obvious present inventions of claims 15 and 17.

8. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al (6,365,321 B1) in view of Fujie et al (6,303,264 B1) as applied to claim 1 above, and further in view of Sato et al (5,948,589).

Chen et al in view of Fujie et al with respect to present claim 1 is discussed above in Paragraph 7. Chen et al in view of Fujie et al do not teach the use of presently claimed carboxylic acid compound of claim 14. However, it is well known in the art, as evidenced by Sato et al, col.7, lines 54-61, to use a carboxylic acid compound in a positive working photoresist composition to prevent an undue decrease in the photosensitivity of the composition due to the presence of an amine compound, and also to increase the pattern resolution along with an improving effect in the adaptability of the resist composition to various kinds of substrates to give a satisfactory patterned resist layer. Sato furthermore teaches the amount of the carboxylic acid to be 0.01 to 5 wt% based on the amount of a resinous compound having acid-decomposable group. Based on Sato's teaching, it would have been obvious to one of ordinary skill in the art to use a carboxylic acid compound in Chen's composition in the amount of 0.01-5 wt% based on the amount of Chen's resin binder with a reasonable expectation of preventing an undue decrease in the photosensitivity of the composition due to the presence of an

amine compound and also to increase the pattern resolution along with an improving effect in the adaptability of the resist composition to various kinds of substrates to give a satisfactory patterned resist layer as taught by Sato et al. Since the range of 0.01-5 wt% for the amount of the carboxylic acid compound based on the amount of the resinous compound as taught by Sato overlaps with present range of claim 14, Sato's teaching would render present range of claim 14 *prima facie* obvious. See In re Wertheim, supra. Therefore, Chen in view of Fujie, and further in view of Sato would render obvious present invention of claim 14.

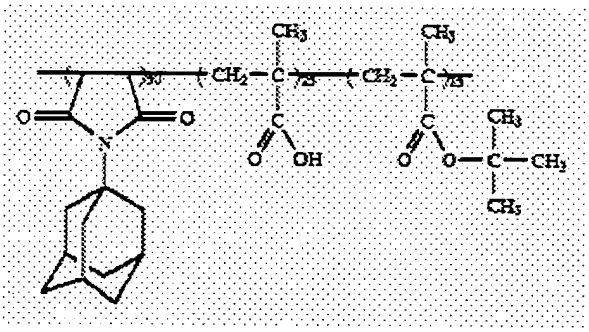
9. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al (6,365,321 B1) in view of Fujie et al (6,303,264 B1) as applied to claim 15 above, and further in view of Padmanaban et al (6,329,117 B1).

Chen et al in view of Fujie et al with respect to present claim 15 is discussed above in Paragraph 7. Chen teaches coating his resist composition on a silicon wafer treated with an organic anti-reflective coating (see col.13, lines 21-22), but without giving the thickness for the organic anti-reflective coating. Padmanaban (see col.3, lines 52-56 and col.11, lines 55-67) teaches providing an anti-reflective coating film between a substrate and a positive working chemically amplified deep UV photoresist composition layer in order to reduce problems associated with reflected light from the substrate and topography during pattern formation. Padmanaban teaches forming such anti-reflective coating film having thickness of 60 nm on a silicon wafer. Based on Padmanaban's teaching, it would have been obvious to one of ordinary skill in the art to provide an anti-reflective coating film having thickness of 60 nm between Chen's silicon

wafer and Chen's photoresist composition layer with a reasonable expectation of reducing problems associated with reflected light from the substrate and topography during pattern formation as taught by Padmanaban et al. Therefore, Chen in view of Fujie, and further in view of Padmanaban would render obvious present invention of claim 16.

10. Claims 1, 4, 5, 10-13, 15, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ushirogouchi et al (5,932,391) in view of Fujie et al ((6,303,264 B1).

In Example 19, Ushirogouchi teaches (see col.8, lines 38-44, Table 3 in col.37, col.34, lines 17-30) a chemically amplified positive type resist composition containing a polymer which is shown below



and a photoacid generator. The polymer shown above contains a t-butyl group (a tertiary alkyl group) which is the present acid dissociable group of present claims 4 and 5, and thus Ushirogouchi teaches present resinous compound of claim 1 having acid-dissociable groups and capable of being imparted with increased solubility in an aqueous alkaline solution by interaction with an acid. Ushirogouchi coats his resist composition on a silicon wafer to a thickness of 0.6 um (which is equal to *600 nm*), and then the resist film is imagewise exposed to *ArF excimer laser* beam and developed to

remove the exposed portion of the resist film, thus forming a positive resist pattern (see col.38, lines 14-26).

Ushirogouchi also teaches (col.29, lines 14-23) that his composition can contain a surfactant for modifying a coated film, but without specifying the amount of the surfactant to be used. Fujie et al, a reference which also teaches a chemically amplified positive resist composition, teaches (col.20, lines 61-67, col.21, lines 1-4) that surfactants preferably used to aid formation of a resist film are fluorine-containing nonionic surfactants and that the amount of the surfactants is preferably 0.001 to 10 parts by weight per 100 parts by weight of the polymer components. Since 0.001 part is included as the lower end of the taught range, it would have been obvious to one of ordinary skill in the art to use a fluorine-containing nonionic surfactant in Ushirogouchi's invention in the amount of 0.001 parts by weight per 100 parts by weight of Ushirogouchi's polymer (this amount converts to *10 ppm by weight* ($0.001 / 100 = 10^{-5} =$ 10 ppm) of the surfactant based on the amount of Ushirogouchi's polymer) with a reasonable expectation of aiding formation of Ushirogouchi's resist film as taught by Fujie.

In present claim 1, applicants state that the amount of the surface active agent is lower than 10 ppm, and the term "lower than 10 ppm" includes 9.9 ppm, for example. The value of 10 ppm, which is taught by Fujie, is so close to 9.9 ppm that one skilled in the art would have expected them to have the same properties, and thus, Fujie's teaching would render present range *prima facie* obvious. See In re Titanium Metals Corporation of America v. Banner, supra. Therefore, Ushirogouchi in view of Fujie

would render obvious present inventions of claims 1, 4, 5, 11, 12, and 15: it is the Examiner's position that Ushirogouchi's resist film thickness of 600 nm is close enough to the higher end (i.e., 570 nm) of the present range that one skilled in the art would have expected them to have the same properties, and thus Ushirogouchi's teaching would render present thickness range of 100 to 570 nm *prima facie* obvious. See In re Titanium Metals Corporation of America v. Banner, supra.

With respect to present claim 10, since Ushirogouchi states (col.29, lines 66-67, col.30, lines 1-8) that his resist composition can be used with a deep UV beam such as KrF or ArF excimer laser beam, it is the Examiner's position that Ushirogouchi's photoacid generator is capable of generating an acid by the irradiation with KrF excimer laser beam as presently recited in claim 10. Therefore, Ushirogouchi in view of Fujie would render obvious present invention of claim 10.

With respect to present claim 13, Ushirogouchi does not teach the use of a tertiary aliphatic amine compound in his invention. However, it well known in the art, as evidenced by Fujie (col.20, lines 24-51), to use a tertiary aliphatic amine compound (for example, tri-n-propylamine) as a sensitivity adjustor in a chemically amplified positive type resist composition. Fujie teaches the use of the sensitivity adjustor in the amount of 0.001 to 10 parts by weight per 100 parts by weight of their polymer components. Therefore, it would have been obvious to one of ordinary skill in the art to use a tertiary aliphatic amine compound such as tri-n-propylamine in the amount of 0.001 to 10 parts by weight per 100 parts by weight of the polymer component in Ushirogouchi's invention in order to be able to adjust sensitivity of the composition. Since the range taught by

Fujie overlaps with present range of 0.01 to 1 part by weight, the prior art's range would have made present range *prima facie* obvious. See In re Wertheim, supra. Therefore, Ushirogouchi in view of Fujie would render obvious present invention of claim 13.

With respect to present claim 17, as discussed above, Ushirogouchi coats his resist composition on a silicon wafer to a thickness of 600 nm. It is the Examiner's position that this value is close enough to the higher end of the present range (300-*570 nm*) that one skilled in the art would have expected them to have the same properties and therefore the prior art's thickness value would have made present thickness range *prima facie* obvious. See In re Titanium Metals Corporation of America v. Banner, supra. Therefore Ushirogouchi in view of Fujie would render obvious present invention of claim 17.

11. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ushirogouchi et al (5,932,391) in view of Fujie et al (6,303,264 B1) as applied to claim 1 above, and further in view of Sato et al (5,948,589).

Ushirogouchi et al in view of Fujie et al with respect to present claim 1 is discussed above in Paragraph 10. Ushirogouchi et al in view of Fujie et al do not teach the use of presently claimed carboxylic acid compound of claim 14. However, it is well known in the art, as evidenced by Sato et al, col.7, lines 54-61, to use a carboxylic acid compound in a positive working photoresist composition to prevent an undue decrease in the photosensitivity of the composition due to the presence of an amine compound, and also to increase the pattern resolution along with an improving effect in the adaptability of the resist composition to various kinds of substrates to give a satisfactory

patterned resist layer. Sato furthermore teaches the amount of the carboxylic acid to be 0.01 to 5 wt% based on the amount of a resinous compound having acid-decomposable group. Based on Sato's teaching, it would have been obvious to one of ordinary skill in the art to use a carboxylic acid compound in Ushirogouchi's composition in the amount of 0.01-5 wt% based on the amount of his polymer component with a reasonable expectation of preventing an undue decrease in the photosensitivity of the composition due to the presence of an amine compound and also to increase the pattern resolution along with an improving effect in the adaptability of the resist composition to various kinds of substrates to give a satisfactory patterned resist layer as taught by Sato et al. Since the amount of 0.01-5 wt% as taught by Sato overlaps with present range of claim 14, Sato's range would render present range prima facie obvious. See In re Wertheim, supra. Therefore, Ushirogouchi in view of Fujie, and further in view of Sato would render obvious present invention of claim 14.

12. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ushirogouchi et al (5,932,391) in view of Fujie et al (6,303,264 B1) as applied to claim 15 above, and further in view of Padmanaban et al (6,329,117 B1).

Ushirogouchi et al in view of Fujie et al with respect to present claim 15 is discussed above in Paragraph 10. Ushirogouchi in view of Fujie do not teach presently claimed antireflection coating film of present claim 16. However, it is well known in the art, as evidenced by Padmanaban, col.3, lines 52-56 and col.11, lines 55-67, to provide an anti-reflective coating film between a substrate and a positive working chemically amplified deep UV photoresist composition layer in order to reduce problems associated

with reflected light from the substrate and topography during pattern formation. Padmanaban teaches forming such anti-reflective coating film having thickness of 60 nm on a silicon wafer. Based on Padmanaban's teaching, it would have been obvious to one of ordinary skill in the art to provide an anti-reflective coating film having thickness of 60 nm between Ushirogouchi's silicon wafer and his photoresist composition layer with a reasonable expectation of reducing problems associated with reflected light from the substrate and topography during pattern formation as taught by Padmanaban et al. Therefore, Ushirogouchi in view of Fujie, and further in view of Padmanaban would render obvious present invention of claim 16.

13. It is to be noted that although Sato et al'589 teaches the use of a carboxylic acid compound in a positive working photoresist composition as discussed above, the reference was not combined with *Fujie et al'264* to reject present claim 14 because Fujie et al discourages such use of a carboxylic acid compound (see col.21, lines 53-67, col.1, lines 45-59).

Allowable Subject Matter

14. Claim 18 is allowed. None of the cited prior arts teaches or suggests present photosensitive material of claim 18 which has to have a substrate having an adsorbent thereon for the surface active agent.

Response to Arguments

15. Applicants argue that Fujie'264 discloses a film thickness of 0.5 to 2 um, this disclosure has no further significance other than a conventionally operable range and

that the thickness disclosed in the Examples of Fujie is limited to 1 um, further remote from the thickness limitation in claim 1.

The Examiner disagrees. First of all, in In re Mills and Palmer, 176 USPQ 196, it was held that non-preferred embodiments cannot be ignored, and even if the non-preferred embodiments are used, obviousness exists. Patentee, in the same manner as applicant, is *not limited* in his teachings to *only the exemplified subject matter*. Fujie clearly teaches that his resist composition can form a resist film of 0.5-2 um thickness, and one skilled in the art would immediately envisage using 0.5 um (500 nm) thick resist film in Fujie since 0.5 um is *clearly included as the lower end of the taught range*. (besides, since the prior art teaches all of the present components of claim 1, the prior art's composition would *inherently* be suitable for the formation of a photoresist layer having a thickness in the range from 100 to 570 nm on the surface of a substrate as presently recited in claim 1).

Applicants also argue that Example 1 of Fujie uses 10000 ppm and thus that the reference is in now way suggestive of the upper limit 10 ppm. Again, Patentee, in the same manner as applicant, is *not limited* in his teachings to *only the exemplified subject matter*. Fujie clearly teaches that surfactants such as fluorine-containing nonionic surfactants can be added in the amount of *0.001* to 10 parts by weight per 100 parts by weight of his polymer components. Since 0.001 parts by weight is clearly included as the lower end of the taught range, one of ordinary skill in the art would immediately envisage using 0.001 parts by weight of the surfactant in Fujie's resist composition. The value of 0.001 parts by weight per 100 parts by weight of the polymer component

converts to *10 ppm by weight*. In present claim 1, applicants state that the amount of the surface active agent is lower than 10 ppm, and the term "lower than 10 ppm" includes 9.9 ppm, for example. The value of 10 ppm, which is taught by Fujie, is so close to 9.9 ppm that one skilled in the art would have expected them to have the same properties, and thus, Fujie's teaching would render present range *prima facie* obvious. Where the claimed ranges and prior art do not overlap but are close enough that one skilled in the art would have expected them to have the same properties, a *prima facie* case of obviousness would exist ***which may be overcome by a showing of unexpected results***, In re Titanium Metals Corporation of America v. Banner, 227 USPQ 773 (Fed. Cir. 1985). Therefore, in the absence of showing of unexpected results, Fujie's range for the surfactant renders present range *prima facie* obvious.

For the reasons stated above, present rejections still stand.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sin J. Lee whose telephone number is 571-272-1333. The examiner can normally be reached on Monday-Friday from 9:00 am EST to 5:30 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia Kelly, can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is **571-273-8300**.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

S. Lee
September 2, 2005

SIN LEE
PRIMARY EXAMINER